[Second Edition.]

PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Improvements in the Production of a Protective Coating of Hard Rubber on Paper, Pasteboard and the like.

I, EUGEN SACHS, of 4—5, Halberstadterstrasse, Berlin-Halensee, Germany, a German national, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

As is well known, there are placed on machines, apparatus and appliances used in industry, and in particular in the chemical and textile industries very severe requirements difficult to fulfil, with respect to resistance to corrosion from water, vapours and chemicals with at the same time sufficient mechanical strength. It is also known that hard rubber in its different grades is the most suitable material in satisfying these requirements from a chemical point of view, and they are consequently often used as constructional material or as a coating for metal apparatus or appliances in the chemical and textile industries.

The term "hard rubber" as used in this specification means vulcanised rubber containing at least 15% sulphur and includes hard rubber in its different grades of hardness, elasticity, chemical resistance etc., which in common contain the aforesaid minimum percentage of sulphur such as are known in the trade as vulcanite, ebonite, leather-rubber, etc. Metal articles coated with such rubber have, however, a whole series of disadvantages caused by the unequal expansion of these two materials with changes of temperature, by the different heat conductivities and by the heavy weight of the metals themselves, and the like. For example, hard rubber coating tends to peel from the metal and to the formation of cracks, often invisible, whereby a rapid destruction of the articles takes place.

To avoid these disadvantages, it has already been proposed to use porous materials of animal or preferably vegetable origin as the base for the hard rubber protective coating, such for example as paper, pasteboard, papiermache, and similar artificial materials, asbestos, textiles and fabrics of all kinds, and also wood. These proposals have not, however, led to successful results since with a continued use of such articles, in particular under high temperatures (80—100° C.) the hard rubber layer usually becomes detached from the base. This is astonishing in so far as these inconveniences are not met with soft-rubber which has a much better power of uniting with and adhering to these materials.

It has now been found that this trouble is primarily caused by the air and moisture almost always present in the said constructional materials, and which either immediately on the vulcanising on of the hard rubber layer or during later use of the articles, cause the formation of bubbles or blisters which lift the hard rubber layer from the base, this having as a result a rapid destruction.

It has been previously proposed to impregnate materials such as fabrics and paper with natural or artificial resins and to apply to the impregnated material a rubber composition which is subsequently vulcanised, for the purpose of making non-rigid and more or less flexible articles such as tyres, belts, hoses and insulated floor coverings. In contradistinction to these prior proposals my invention relates exclusively to the production of rigid and non-flexible articles, and consists in a process for producing such articles having a very firmly adhering hard-rubber coating on a core of originally porous material, such as paper, pasteboard, papiermache, textiles, fabrics or wood wherein the dry or dried articles are impregnated with a hard resin, and a layer of a rubber mixture is applied to the articles and then the layer is transformed on the article by vulcanisation into hard rubber.

Moreover, according to my invention, the rubber layer is applied directly to the articles, that is to say, without the interposition of an adhesive or any connecting

layer between the said rubber layer and the impregnated articles.

By the term "hard resin" as used in this specification is meant a resin which is at least as hard as ordinary colophony and thus this term does not include gum resins.

In carrying out the invention, the articles consisting of the above-mentioned materials are first subjected to a treatment in order to remove as far as possible the air and moisture from them and to fill up the pores—in particular those of the surface layers whereby simultaneously the flexibility of the objects is removed. This treatment consists in removing moisture which may happen to be present and in impregnating the dry or dried articles with a hard resin, preferably with a hardenable resin of the phenol-formaldehyde-type. This impregnation is effected in the usual manner, for instance with solutions of the resin and subsequently removing the solvent by evaporation. The article can be subjected, before, during or after the impregnation to pressure. It is advisable to so choose the resins that these have a specially good property of adhesion for the particular kind of hard rubber to be applied. After this preliminary treatment, the plastified rubber mass, if necessary also preliminarily shaped, is applied to the impregnated article, which rubber mass is thus not used in the form of an actual solution of the rubber in solvents such as benzene, carbon tetrachloride, etc. The composition of this mass is so chosen that after suitable vulcanisation it passes into more or less elastic hard rubber.

This hard rubber coating may be very thin without tending to peel off. Neither does it tend to crack and it permits the production of articles uniting the light weight and mechanical strength of the base material with the resistance to corrosion of the hard rubber.

It is naturally also possible to embed metal framings such as wire network, metal rods, metal spirals, etc., in the basic material or in the rubber coating.

EXAMPLE 1.

Pasteboard of, for example, 5 mm. in thickness, is dried in order to remove all moisture and impregnated with a 20% solution of phenol-formaldehyde resin in spirit or acetone. The saturation can take place under pressure or partial vacuum. The material is freed from the solvent by drying, is, if necessary, roughened on the outside and is hardened by heating to 140° to 160° C. A plastified rubber mixture consisting of :—

16 parts	Para rubber
20 „	Mozambique rubber
6 „	Borneo rubber
10 „	Chalk
10 „	Hard rubber dust
1 „	Linseed oil
24 „	Sulphur Powder
3 „	Carbonate of Lime
10 „	Thiourea
100	

is applied in a suitable manner, for example by spreading and the object is then vulcanised at 145° to 150° C. for about fifteen minutes. A hard pasteboard with a layer of hard-rubber of the grade known as leather-rubber is then obtained, this latter layer adhering so firmly to the pasteboard that it cannot be removed without destroying the article. By longer vulcanisation, e.g. for 45 minutes, the rubber layer is made more like hard rubber of the grade known as ebonite.

EXAMPLE 2.

Ply-wood dried and impregnated with hardened colophony (that is, colophony which has been heated with calcium oxide, zinc oxide or glycerine) is compressed under pressure and is coated with a plastified rubber mass of the following composition rolled out into plates :—

12 parts	Para rubber
7 „	litharge
1.5 „	zinc sulphide
9 „	barytes
20 „	sulphur
3 „	linseed oil
6 „	accelerator

On the vulcanisation of the article under a steam pressure of 5 atm. at 148° C. for 40 minutes, there is obtained a hard rubber layer firmly adhering to the ply-wood.

EXAMPLE 3.

A thick textile material is dried and impregnated with a lacquer comprising hardened colophony and phenol-formaldehyde resin, dried and coated with a mass of the following composition :—

1.0 ltr.	concentrated latex (60%)
200 gr.	sulphur powder
12 gr.	carbonate of zinc
25 gr.	Kieselguhr
40 gr.	20% ammonia solution
5 gr.	Zinc stearate

The impregnated material coated with this mass is then dried or preliminarily vulcanised for about 20 minutes at 110—

120° and then fully vulcanised at about 140° C. for some 20—30 minutes.

The hard rubber layer than adheres so firmly to the base that it cannot be separated.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is :—

1. Process for the production of rigid and non-flexible articles having a very firmly adhering hard-rubber coating on a core of originally porous material, such as paper, paste-board, papiermache, textiles, fabrics or wood, which process consists in impregnating the dry or dried articles with a hard resin, applying directly to the articles a layer of a rubber-mixture containing at least 15% sulphur and transforming the layer on the article by vulcanisation into hard-rubber.

2. Process according to claim 1, characterised by the article being subjected to pressure or to a pressing before, during or after the impregnation.

3. Process according to claims 1 and 2, characterised by the vulcanisation taking place under pressure.

4. Process according to claims 1 to 3, characterised by reinforcing bodies such as metal strips, network or spirals being embedded in the basic substance or in the hard rubber coating.

5. Process for the production of rigid and non-flexible articles having a very firmly adhering hard-rubber coating on a core of originally porous material, such as paper, paste board, papiermache, textiles, fabrics and the like, substantially as hereinbefore described.

6. Articles as specified in claim 1 provided with a protective coating by the process claimed in any of the preceding claims.

Dated this 29th day of June, 1934.

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